

Mathematics Toolkit: Grade 6 Objective 3.C.1.b

Standard 3.0 Knowledge of Measurement

Topic C. Applications in Measurement

Indicator 1. Estimate and apply measurement formulas

Objective b. Estimate and determine the volume of a rectangular prism

Assessment Limits:

Use rectangular prisms and whole number dimensions (0 – 1000)

Table of Contents

Objective 3.C.1.b Tools

- Prerequisite Skill

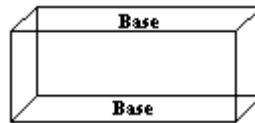
Prerequisite Skill

Mathematics Grade 6 Objective 3.C.1.b Assessment Limit 1

Skill 1: Understanding Measurement Terms Associated with Volume

The terms volume, prism, length, width, height and area must be understood to develop the concept of volume. Building comprehension of these terms should be done using a model to demonstrate the relationships between the terms.

- Volume is the amount of space a three-dimensional object occupies.
- Prisms are 3-dimensional closed figures with faces that are polygons. At least two of the faces of the prism are congruent and parallel.
- A rectangular prism is a prism with rectangular bases and sides. There are two bases that are congruent and there are four sides. See the diagram below:



Note: Use three-dimensional model to demonstrate that the selection of bases in a rectangular prism is arbitrary. If the prism is placed on another side that has not been designated the base, that side and the side opposite it will be the bases. Use these models to develop the meaning of each term through demonstration. Ideally students should be given the opportunity to hold and touch their own model as the teacher demonstrates with a model.

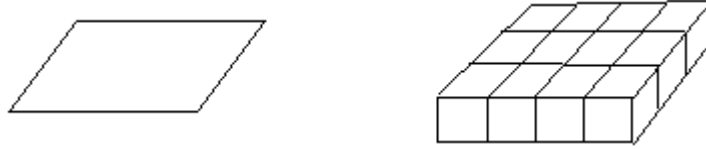
- Length is the distance along a line (one-dimensional measure) or the length of an edge of a figure from one vertex to another.
- Width is also the distance along an edge of a two-dimensional figure or three-dimensional solid.
- Area of a Base is the product of the length and width of that base.
- Height is the perpendicular distance between the bases of a prism.

Skill 2: Understanding the Concept of Volume as a Measure

- Use unit cubes (or any small cubes) and build three-dimensional shapes to begin building an understanding of volume and its units of measure. Starting with small cubes, define each one as a single cubic unit.
- Build a single rectangular layer with cubes (cubic units) within the base of the rectangular solid shape. Determine the volume of this layer by counting the cubes. Build the same rectangular layer on top of the original layer and determine the volume by again counting the cubes. Continue to build layers until the appropriate height has been reached.
- Connect the number of cubes in each layer to the area of the base. Connect the number of layers to the height. Connect the area of the base and the height to the volume of the shape.

Example: Determine the volume of a 3 inch by 4 inch by 3 inch rectangular solid. Below is a drawing of the 3x4 base of the rectangular solid and the first layer.

Build the first layer on the base and continue building the solid by stacking 3 layers.



Sources for cube activities include Area and Volume, Marion Smoothey, Marshall Cavendish Corporation, 1993 and The Super Source, Measurement, Deborah J. Slade, Carol Desoe, Cuisenaire Company, 1999.

Skill 3: Develop the Formula for the Volume of a Rectangular Solid

Once students understand the relationship between base and the height of the prism, the formula can be stated:

Volume of a Rectangular Prism = Area of the base x height
 Volume of a Rectangular Prism = Length x width x height

Students will apply formulas by substituting values in place of variables to determine the area of rectangles. Work with students to move from the concrete representation of prisms as stacks of cubes to the application of volume formulas using given measurements.

Skill 4: Computation

Students will be able to multiply with whole numbers using a calculator (0-1000).

Skill 5: Estimation

Students will be able to round to different place values, including to the nearest ten or hundred, to aid in their estimation of the area of polygons and volume of prisms.